

REMARKS

Initially, applicant wishes to thank the Examiner for his time in conducting the telephonic interview with applicant's attorney on September 17, 2004.

Claims 11-21, 28 and 29 are pending in the application. Favorable reconsideration and allowance of this application is respectfully requested in light of the remarks that follow.

1. Priority Claim

In the Office Action the Examiner acknowledges the priority claim made based on the pair of patent applications filed in the United Kingdom on January 25, 2000 and July 12, 2000. However, the Examiner states that certified copies of the patent applications from which this application claims priority have not been filed as required by 35 U.S.C. Section 119(b).

With this response, applicant hereby submits certified copies of each of United Kingdom Patent Application Serial No. 0001699.8 and United Kingdom Patent Application Serial No. 0017188.4 in satisfaction of the requirement under 35 U.S.C. Section 119(b).

2. Restriction Requirement

In the Office Action the Examiner has issued a Restriction Requirement between Group 1A containing claims 11-21, 28 and 29 directed to a staged reactor having one catalyst, and Group 1B containing claims 22-27 pertaining to a reactor with first and second reactor beds. Pursuant to a telephone conversation with applicant's attorney on March 11, 2004, a provisional election was made of Group 1A, claims 11-21, 28 and 29 for further prosecution.

With this response, applicant hereby affirms the election of the claims of Group 1A, namely claims 11-21, 28 and 29, by canceling the claims of Group 1B, namely claims 22-27 in this response.

3. Rejections Under 35 U.S.C. Section 103(a)

The rejections of claims 11-21, 28 and 29 under 35 U.S.C. Section 103(a) as being unpatentable over applicant's submitted prior art and Figure 1 in view of D. Reay, "Learning From Experiences With Compact Heat Exchangers" (the Reay reference) or in view of Hesselgreaves U.S. Patent No. 5,193,611 (the '611 patent) are respectfully traversed, because, inter alia, there is no teaching or suggestion to combine or modify the references to produce the claimed invention. Furthermore, even if the references were combined, the claimed invention would not result.

Independent claim 11 requires a reactor having adiabatic beds of catalyst that receive reactants for reaction purposes and at least one heat exchanger panel interposed between the adiabatic beds of catalyst that receives reactants for heat exchange purposes. The heat exchanger panel includes discrete passages for handling both reactant fluid flow and heat transfer media flow. Further, the passages for the heat transfer media in the heat exchanger panel permit at least two differing flow path directions for the heat transfer media through the heat exchanger panel.

Further, independent claim 21 defines a process for performing chemical reactions under controlled temperature conditions in which the process includes delivering reactant fluids through a chemical reaction zone to achieve a reaction and through a heat exchanger bounding the chemical reaction zone to allow heat exchange between the reactant fluids and a heat transfer

medium. The heat exchanger bounding the chemical reaction zone is defined at least in part by a printed circuit heat exchanger (PCHE) panel that provides separate passages for flow of the heat transfer medium therein and for flow of the reactant fluids therein. Further, the process includes the step of causing the heat transfer medium to the flow in at least two differing directions through the passages in the PCHE panel with respect to the flow of reactant fluids through the panel.

In contrast, as recognized by the Examiner, applicant's admitted prior art and Figure 1 of the present application discloses the flow of a transfer medium through a heat exchanger in only one direction generally perpendicular to the flow of the reactant fluids.

However, the Reay reference is unable to cure this deficiency of the admitted prior art found in Figure 1 of the present application. More specifically, the Reay reference discloses various design features of a PCHE, including the ability of a PCHE to be formed to optimize counter flow or encourage turbulent flow within the PCHE to form a number of passages and a number of streams that can be directed through the PCHE. However, the Reay reference does not disclose or suggest any use of a PCHE within a staged chemical reactor solely for the purposes of heat exchange between the reactant and the heat transfer medium as required by claims 11 and 21. In fact, the only end uses for PCHE that are even discussed in the Reay reference are uses as compressor after-cooler, gas cooler, gas dehydration train, and in cryogenic processes for the removal of inert substances from streams as well as a heat exchanger-reactor as shown in Fig. 8.3. Thus, nowhere in the Reay reference is it suggested that a PCHE can be utilized effectively in an adiabatic reactor as a heat exchanger panel that receives reactants for

heat exchange purposes and is positioned between or bounding a chemical reaction zone that receives reactants for reaction purposes as required by claims 11 and 21.

The '611 patent is also unable to overcome the shortcomings of the admitted prior art in Figure 1 of the present application. More specifically, the '611 patent is directed to a perforated secondary plate 12 that is positioned within the fluid pathways 16-18 defined between the primary plates 10 of a heat exchanger to turbulate the fluid flowing in the pathways 16-18 in only a single direction as illustrated in all of the drawing figures. Also, the '611 patent only discloses PCHEs as a type of heat exchanger that is formed with plates including heat transfer passages that are diffusion bonded together to form a solid block. The '611 patent goes on to state that PCHEs are not suitable for use in certain circumstances based on the facts that PCHEs employ only primary plates direct to the fluids through passages formed in the PCHE that do not sufficiently agitate the fluid flowing through the channels formed between the primary plates. Therefore, the '611 patent teaches directly away from the use of a PCHE as a heat exchanger.

In addition, there is no mention or suggestion in the '611 patent of the use of a heat exchanger, PCHE or otherwise, that receives reactants for heat exchange purposes, is positioned in operative contact with a reaction zone of an adiabatic staged reactor that receives reactants for reaction purposes, and that has at least two passes in differing directions for the heat transfer medium through the heat exchange panel. Therefore, the '611 patent also does not show or suggest in combination with applicant's admitted prior art the subject matter of claims 11 or 21.

Dependent claims 12-20, 28 and 29 each depend from independent claim 11 and consequently include all the limitations found in claim 11. As discussed previously, the admitted prior art in Figure 1 of the present application in conjunction with either the Reay reference or

the '611 patent fails to show or suggest each of the elements of claim 11, specifically a PCHE that receives reactants for heat exchange purposes and includes passages for more than one flow path for a heat transfer medium through the PCHE and the positioning of the PCHE between or bounding separate reaction zones in an adiabatic reactor that receive reactants for reaction purposes. As a result, because the admitted prior art in Figure 1 of the present application in conjunction with either the Reay reference or the '611 patent fails to show or suggest the combination of each of the elements of claim 11, from which claims 11-20, 28 and 29 depend, these prior art references also fail to disclose or suggest the combination of the elements of claims 12-20, 28 and 29.

In light of the foregoing, withdrawal of the rejections of claims 1-21, 28 and 29 is respectfully requested.

CONCLUSION

It is submitted that claims 11-21, 28 and 29 are in compliance with 35 U.S.C. Section 103 and each define patentable subject matter. A Notice of Allowance is therefore respectfully requested.

A check in the amount of \$950.00 is submitted with this response to cover the required fee for a 3-month extension of time to respond to the Office Action. No other fees are believed to be payable with this communication. Nevertheless, should the Examiner consider any other fees to be payable in conjunction with this or any future communication, the Director is authorized to direct payment of such fees, or credit any overpayment to Deposit Account No. 50-1170.

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The Examiner is invited to contact the undersigned by telephone if it would help expedite the prosecution and allowance of this application.

Respectfully submitted,



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Dated:

9/21/04

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